

# Empowerment on the Margins: The Online Experiences of Community Health Workers

Azra Ismail

Georgia Institute of Technology, USA  
azraismail@gatech.edu

Neha Kumar

Georgia Institute of Technology, USA  
neha.kumar@gatech.edu

## ABSTRACT

Research in Human-Computer Interaction for Development (HCI4D) routinely relies on and engages with the increasing penetration of smartphones and the internet. We examine the mobile, internet, and social media practices of women community health workers, for whom internet access has newly become possible. These workers are uniquely positioned at the intersections of various *communities of practice*—their familial units, workplaces, networks of health workers, larger communities, and the online world. However, they remain at the margins of each, on account of difference in gender, class, literacies, professional expertise, and more. Our findings unpack the *legitimate peripheral participation* of these workers; examining how they appropriate smartphones and the internet to move away from the peripheries to fully participate in these communities. We discuss how their activities are motivated by moves towards empowerment, digitization, and improved healthcare provision. We consider how future work might support, leverage, and extend their efforts.

## CCS CONCEPTS

• Human-centered computing → Empirical studies in HCI.

## KEYWORDS

Internet; healthcare; India; qualitative; HCI4D; ICTD

## ACM Reference Format:

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## 1 INTRODUCTION

The adoption and appropriation of the mobile phone has been a topic of great and continued interest for the field of Information and Communication Technology and Development (ICTD). As reported in Dell and Kumar’s review of Human-Computer Interaction for Development (HCI4D) [20], a critical factor driving the growth of this field is the increasing affordability of mobile phones and data plans, bringing mobile ownership, access, and use to many new users who have thus far been relegated to the margins of digital existence. Despite widening adoption in recent years, women were still limited users of these devices and the mobile internet, especially women from socioeconomically disadvantaged backgrounds. Sambasivan et al., Wyche et al., Ahmed et al., and Kumar [3, 42, 71, 85], among others, have variously examined women’s ownership and use of mobile phones in Global South contexts. Prior work that has also pointed to the use of internet by marginalized women [84]. We extend this rich but small body of research with one of the first detailed accounts of women in marginalized settings appropriating and using mobile internet and social media, to the best of our knowledge. We focus in particular on the mobile and internet practices of frontline health workers.

Global health has occupied a key focus in HCI4D and contributed to rapid growth of the field. In this body of literature, much recent work has recognized the critical role of frontline health workers [53], viewing them as able and effective intermediaries facilitating access to healthcare among underserved communities. Although numerous global health interventions leverage the roles of these health workers (e.g., [21, 44, 55, 62]), possibilities for equipping them with technologies designed to improve their workflows remain under-explored. Such explorations become even more critical in light of these workers’ increasing adoption of smartphones and data plans, as we found to be the case in Delhi, India.

We present data from a qualitative investigation carried out between 2016 and 2018 in an underserved region of Delhi (India), that included women who were frontline health workers, women from slum communities, and (male) owners of mobile recharge shops. This investigation was conducted as part of a larger study on the healthcare infrastructure in Delhi, including the work practices of frontline health workers. The emergent use of inexpensive mobile internet

by frontline health workers during this period led us to further investigate this phenomenon. Notably, the launch of a new network provider, Reliance Jio, on September 2016 introduced stiff competition in the market and significantly drove down costs for accessing the internet [30].

We take an *intersectional* approach to analyzing our findings, examining the various *intersecting communities of practice* that the frontline health workers are actors across. These communities include the healthcare system, the communities they work in, their own social networks, their households, and the online world at large. There are “*different kinds of difference*” [82] that relegate our participants to a different set of margins in each of these five communities. Across these intersections, we examine the *legitimate peripheral participation* (LPP) of the frontline health workers [47], and discuss the ways in which technology might support, leverage, and extend their efforts to become “full participants” [47].

The contributions of our paper are three-fold. First, we present one of the first studies of women from socioeconomically disadvantaged backgrounds appropriating the internet and social media. Second, we bring to scrutiny the adoption and value drawn from highly inexpensive internet, which women from socioeconomically disadvantaged backgrounds can now access. Third, we outline takeaways for a flourishing body of work in HCI4D and global health, which frequently engages health workers for interventions. Obtaining an in-depth perspective of these workers’ everyday practices and environments enables the HCI4D community to better situate their technology design in the context of their current technological practices, and the potential they present.

## 2 RELATED WORK

Our research connects and extends several active areas of scholarship within HCI. Below, we discuss how we extend research on leisure- and livelihood-driven adoption of mobile phones and the internet in the Global South, as well as women’s recent albeit late adoption of the same. Focusing on healthcare research within HCI4D, we draw attention to the work on frontline health workers that we expand. Finally, we further the application of the theories of legitimate peripheral participation [47] and intersectionality [82].

An extensive body of work in HCI and ICTD has studied mobile adoption and use in the Global South, with a view to understand how marginalized populations are gaining access to the increasingly ubiquitous mobile phone and making meaning of it across disparate contexts. Smyth et al.’s study of entertainment-driven mobile use in urban India [75], Mehra et al.’s most recent work that updates our understanding of these mobile phone ecologies [51], Pal’s analysis of the symbolism of technology in India [60, 61], Rangaswamy and Cutrell’s research on mobile adoption by urban Indian male

youth [67], Nemer’s ethnography uncovering how marginalization is propagated online [59], and Kumar and Parikh’s work on the changing materiality of digital music [43]—these are just some of the many studies that have brought focus and attention to the multi-faceted and increasingly global phenomenon of mobile appropriation “on the margins”. This work has emphasized the importance of understanding not just instrumental uses of the mobile phone (*i.e.*, those that lead to socioeconomic gain in some form), but bringing to scrutiny the uses that are most compelling to the users—also so that these might be appropriately leveraged towards instrumental gains, as captured in Kumar and Anderson’s study of mobile phone use by women in rural India and how this was used to iterate on a community health intervention [42]. In most of the above work, however, mobile use has largely been offline or through WiFi, which is not quite ubiquitous. With the recent introduction of the “virtually free” Reliance Jio mobile internet option in India, having internet connectivity is becoming much less of a hurdle for those on the margins [30]. This is especially a game-changer for women users on the margins, who have traditionally been late adopters of ICTs, not always out of choice.

With women from marginalized backgrounds increasing their adoption of mobile technologies (and more recently, the internet), this phenomenon too has received much attention in HCI4D literature in recent years. Early work on women’s mobile practices in Ghana [13, 15] and South Africa [25], Kumar’s research on (mis)perceptions around the gender divide in India based on a study of mobile phone practices [41], Wyche et al.’s study of what women use their mobile phones for in rural Kenya [85], Ibtasam et al.’s inquiry on the financial inclusion of women in Pakistan [33], and Sambasivan et al.’s recent work on privacy and security challenges that South Asian women face in their use of mobile devices [71]—these works collectively highlight that women in the Global South are faced with a slew of additional barriers impacting their use of the mobile phone. They are frequently the last adopters of mobile devices within their households, they depend on the male members (or children) in their family for access to mobile media, device access has typically been shared, they are generally seen as non-users even when they are not, and there are additional privacy concerns, among other gender-specific challenges that they face. In addition to signaling the generally disempowered nature of women’s technology use in the Global South, these works also highlight that the landscape is changing, and mobile adoption is growing, even amidst this otherwise marginalized group. We find this as well, with our first account of these women on the margins leveraging various mobile affordances to fulfill the numerous roles that they perform on an everyday basis.

The women we study are frontline health workers in urban India, also called ASHAs (short for Accredited Social

Health Activists). ASHAs and other community health workers have been a major focus in HCI4D health research in recent years, primarily because they serve as effective conduits to largely unreachable populations. These workers are viewed as playing a critical role in covering the last mile in healthcare delivery and have been widely engaged in many projects [21, 44, 50, 55, 66, 86]. Researchers have also studied their mobile phone use and media-sharing practices to inform the design of information dissemination interventions [44, 55, 66]. Recent work in this area has considered the use of mobile devices for digitizing data collection and improving the efficiency of current processes [21, 22] and the affordances and constraints of paper and mobile surveys [61]. As researchers begin to explore the potential of internet-enabled health interventions in the Global South, WhatsApp, in particular, appears to be the social media platform of choice [37, 48, 80]. Prior studies indicate that WhatsApp has enhanced communication between supervisors and health workers in low-resource settings in Kenya [29] and Malawi [63], much like in the context we study. However, there is a limited understanding of the broader internet use and online behaviors of health workers and how these (might) intersect with their roles and responsibilities. We aim to enrich this scholarship by unpacking how ASHAs are using smartphones and (virtually free) internet as they operate in different *communities of practice*, and how this might inform the design of more effective healthcare interventions.

The analytical constructs we use to glean takeaways from our inquiry include Lave and Wenger’s theory of Legitimate Peripheral Participation (LPP) [47] and the feminist theory of intersectionality that is increasingly making its foray as its own subfield of Intersectional HCI [82]. LPP theory describes how newcomers in peripheral roles become active participants in a *Community of Practice* (CoP)—a group of people who engage in activities together and support each others’ learning in a shared domain of interest [31, 46, 47, 58]. Researchers have applied Lave and Wenger’s theory within HCI to better understand, for example, online CoPs such as collaborators on Wikipedia [10], among other topics [28, 45, 49, 56]. The term “peripheral” suggests that “*there are multiple, varied, more- or less-engaged and -inclusive ways of being located in the fields of participation*” [47]. Little HCI research, however, discusses how individuals are part of and simultaneously must engage with a number of CoPs in their day-to-day lives (in varying degrees)—at home, at work, and in society—as we see in the case of our research participants. We find that our participants are relegated to the margins across these different CoPs that they operate within.

Considering the peripherality of the ASHAs leads us to engage with intersectionality, which sheds light on multiple co-occurring forms of marginalization. This term was introduced by Crenshaw to bring recognition to the struggles of

black women who experienced marginalization on account of both race and gender [16]. As ASHAs begin to participate on social media and interact with the online world at large, various aspects of their identity act on them simultaneously—gender, socioeconomic status, professional expertise, digital literacy, and more. These become the “*different kinds of difference*” that make them marginal in various ways [88], and we leverage recent scholarship on Intersectional HCI to unpack how an understanding of their multiply marginalized identities might inform pathways for technology design [73, 82]. The larger discourse within HCI and ICTD that we contribute to with our study is whether and how women who are multiply marginalized in the Global South might use ICTs, and how we as designers might assist with the technology we introduce. Sultana et al. have recently raised compelling questions around whether it is possible for designers from the Global North to design for women in heavily patriarchal societies, and if we might need to recalibrate our feminist perspectives as we switch from Global North to Global South contexts [77]. Our aim is to highlight the “*third world feminisms*” that we see enacted by the ASHAs, as Ismail and Kumar draw attention to [35, 54], to consider the possibility that the answers might rest where such questions are raised.

### 3 METHODOLOGY

Our research objective was to ascertain ASHAs’ technology, internet, and social media practices to identify opportunities for designing technologies to assist in their day-to-day workflows. To this effect, we conducted three sets of semi-structured interviews with 20 ASHAs (see Table 1) in July 2016, February 2018, and July 2018. We also conducted participant observation online (on Facebook and WhatsApp) and offline (through interactions during interviews). Between January to July 2018, we observed seven all-ASHA WhatsApp groups; four groups with two participants, the rest with three, five, and fifteen participants each. Offline participant observations were conducted by shadowing ASHAs during their visits to low-income households over six days. Many of the household members visited were low-literate. In this paper, we use the term “low-literate” to refer to a participant’s self-proclaimed lack of fluency in reading and writing. We also interviewed five owners of mobile phone recharge shops to get some background understanding. These shops form a significant part of the mobile ecosystem in India and are where consumers often visit to purchase prepaid plans. Mobile recharge services are generally a secondary function of these shops; they otherwise operate as stationery shops or technology repair centers. Finally, to develop a deeper understanding of the Indian mobile market and adoption of Reliance Jio [30], we also conducted content analysis—analyzing promotional offers, advertisements, and newspaper articles released between 2016 and 2018.

Participant	Age	Region	Personal Mobile Device
1	50-55	Jogabai	Android Phone (Samsung)
2	30-35	Jogabai	Android Phone (Samsung)
3	20-25	Jogabai	Android Phone (Samsung)
4	45-50	Jogabai	Feature Phone (Nokia)
5	25-30	Jogabai	Android Phone (Samsung)
6	30-35	Batla House	Feature Phone (Nokia)
7	25-30	Batla House	Android Phone (Vivo)
8	20-25	Batla House	Android Phone (Samsung)
9	25-30	Batla House	Android Phone (Samsung)
10	25-30	Batla House	Android Phone (Samsung)
11	30-35	Batla House	Android Phone (Micromax)
12	50-55	Batla House	Android Phone (Samsung)
13	55-60	Khizarabad	Android Phone (Samsung)
14	25-30	Khizarabad	Android Phone (Vivo)
15	30-35	Khizarabad	Android Phone (Oppo)
16	40-45	Khizarabad	Android Phone (Samsung)
17	25-30	Khizarabad	Android Phone (Samsung)
18	45-50	Khizarabad	Android Phone (Samsung)
19	35-40	Okhla Village	Android Phone (Micromax)
20	55-60	Okhla Village	Feature Phone (Nokia)

**Table 1: Demographic Information of ASHA Participants**

Our study was approved by the Institutional Review Board at the Georgia Institute of Technology, Atlanta, USA. The field work took place in the predominantly Muslim, Jogabai region of South-East Delhi. This area is occupied by illegal settlements with poor infrastructure and has been identified by Delhi's health authorities to be at high risk of disease [70]. The ASHAs we interviewed were from lower-middle income groups, with annual household income between INR 2 lakhs to 6 lakhs (approx. USD 2.7k to USD 8.3K) [19]. The households visited belonged to the lowest income groups with annual household income below INR 2 lakhs [19]. As of 2018, almost all ASHAs had been on the job for the last four years; three had worked for two years. The six ASHAs from Khizarabad were Hindu, the remaining were all Muslim. Many of the ASHAs were migrants from Northern states of India, some of whom had moved to Delhi after marriage. All the ASHAs reported at the same local primary health care center in Batla House. Participants were recruited through referrals; after an initial introduction to two ASHAs by the local clinics, we recruited the other 18 using snowball sampling [26]. All our participants had studied up to tenth grade—the minimum requirement for becoming an ASHA.

We had at least two interactions with all ASHAs (more in some cases). Interview sessions were 45–60 minutes and questions focused on their current and past use of mobile phones and the internet for work, household tasks, and leisure. All interactions and data collection took place in Hindi. Interview

and observation data was collected in the form of field notes, audio recordings, and photographs. All data was recorded only after the consent of ASHAs and respondents, and was later anonymized. Names used in the writing of this paper are pseudonyms. Observations, interviews, and focus group discussions were conducted by the first author who has lived in this region for over a year and has previously conducted ethnographic research on healthcare access in the slums of Delhi [34] and participatory observation with frontline health workers [35]. During this prior engagement, we found that ASHAs skillfully navigated the various communities they were part of, and the mobile phones they used were appropriated to support these interactions. Our initial findings led us to more deeply study the ASHAs' appropriation of mobile phones and the internet in July 2018, supported with data from their social media activities. Thus, our engagement with ASHAs has been ongoing since 2016, online and offline.

### Data Analysis

All data was translated from Hindi to English by the first author, and collectively analyzed using the inductive process outlined by Merriam [52]. We conducted several rounds of open coding, focusing on findings relating to the mobile and internet practices of the ASHAs. Generated codes were shared and discussed by all authors after each iteration. The first round of coding closely followed the text. The next round of coding was more high-level and resulted in codes such as *“use of WhatsApp for work”*, *“social media to connect with family”*, and *“infrastructural barriers to internet use”*. Subsequent rounds of coding combined several codes to surface larger themes such as *“challenging gender norms in the household”* and *“power dynamics with doctors”*. The emergent themes highlighted the ASHAs' use of mobile phones and the internet to navigate and increase their participation as peripheral members of various communities of practice [46], leading us to use the lenses of intersectionality [82] and legitimate peripheral participation [47] in our analysis.

### Self-Disclosure

Azra and Neha are of Indian origin, have conducted research in Delhi, and previously studied the work practices of ASHAs in rural/urban India. Neha has also previously studied mobile and internet use among women in varied Indian settings. We are, hence, well-positioned to examine social media and mobile usage among ASHAs. As feminist scholars and “third world women” [54] located in privileged academic settings of the Global North, having conducted extensive research in the South, we are sensitive to the intersections of race, class, and gender in our work. Through our work, we hope to draw more careful attention to healthcare-related challenges and opportunities in the Global South, particularly those intertwined in the lives of marginalized women.

## 4 BACKGROUND

We begin by grounding the ASHAs' activities in the backdrop of the changing mobile landscape in India. On September 1, 2016, Reliance Industries Ltd. introduced a new network operator to the Indian market [76]. In a bid to attract customers, their service, Reliance Jio, launched with a "Welcome Offer" that provided users with four gigabytes of 4G internet every day for three months at zero cost [76]. Additionally, their free SIM provided unlimited calls and 100 SMS messages free every day. This offer was later extended to March 2017, and then again to June 2017 but with 4G data usage capped to one gigabyte a day and a minimum purchase requirement of INR 300 [approx. USD 4.13] to avail the offer [79].

In the two years since its launch, the impact of Jio on the Indian telecom sector has been undeniable, evidenced by news headlines such as: *"The Jio Effect: How the Newcomer Made an Impact in India"*, *"Life after Jio"*, *"Reliance Jio: Industry Disruptor"*, and *"Jio May Be Worth as Much as Sprint"* [6, 7, 39, 57]. The virtually free Jio services resulted in other network providers scrambling to match these prices in order to retain customers. Several major telecom companies also appealed to the Telecom Regulatory Authority of India (TRAI) regarding Jio's predatory pricing. However, with some minor adaptations, the offers were allowed to stand and Reliance Jio continued to operate [69, 76]. As a result, as of 2018, mobile broadband in India is among the cheapest in the world, falling from an average of INR 250 [approx. USD 3.46] to as little as INR 4 [approx. USD 0.055] per gigabyte per day [8, 27, 65]. There has been an 17.22 percent increase in number of internet users in 2017 [24, 30, 38]. Around this time (November 2016), the demonetization of INR 500 and INR 1000 banknotes by the government was carried out [64]. These notes were central to the day-to-day operations of small businesses and further led to increased uptake of online financial services [64]. 2017 also saw the highest increase in the number of smartphone users, driven in part by the proliferation of Indian and Chinese mobile phone brands and the Jio phone program [1, 11, 12, 32, 36, 78].

## 5 FINDINGS

Our data shows that our participants performed various roles as a part of several *communities of practice* [46]—the online world at large, their extended familial units, the network of ASHAs, the state healthcare system, and the communities they served. The ASHAs are on the peripheries of each of these communities, big and small, in different ways. Below we lay out our findings, highlighting the ASHAs' *legitimate peripheral participation* enacted through the use of their mobile phones and data plans [47]. Throughout, we find that the ASHAs' activities online are driven by self-empowerment across the above communities of practice.

## Going Online

ASHAs are part of a growing population of Indians coming online for the first time using mobile data [74]. As new users, they are learning to navigate social norms online as they integrate into online communities. Below we describe the ASHAs' efforts to go online and their online activities.

*Gaining Access to Smartphones and the Internet.* Our participants were typically late adopters of technology for a number of reasons, but they were increasingly adopting mobile phones. When we first conducted interviews in 2016, only 3 of the 20 ASHAs we interviewed had a personal smartphone, the rest had feature phones and a few had shared access to a smartphone. We found internet access and use to be the exception rather than the norm. Our participants who did use the internet either accessed it through their husbands' phones or using a shared computer at home. Device-sharing is a common scenario in the context studied and often comes with constraints on personal privacy, particularly for women [2, 71]. Men (including partners) also tend to underestimate their current level of digital literacy and their capacity to use mobile phones, which is also what we found [41]. Further, the relatively high cost of smartphones made it a luxury, one that most ASHAs were dependent on their higher-earning husbands to purchase. Owning a smartphone was stated to be an aspiration by some ASHAs:

*"I would like to buy an Android phone. I am saving up money from my ASHA work to purchase one. My husband isn't interested in buying one for me. He says—what will you do with one?" (P3)*

The impact of the changing mobile landscape was evident among our participants. When we conducted interviews again in 2018, all our participants had access to a smartphone and the internet. Most of them had personal devices, typically affordable local and Chinese brands, with the rest having shared access. Motivated ASHAs had saved up money to purchase these devices though this took several months and a significant percentage of their meager salary.

Owning a mobile phone was further tied to a sense of autonomy and individuality for our participants, such as P5, *"We need a phone for work. . . I also feel more independent and confident."* We note that in 2016, owning *any* mobile phone (even a feature phone) was considered a sign of independence by our participants as it afforded *"greater mobility and safety"*. This perception still stood in 2018, however, the notion of autonomy was now tied to the smartphone as a result of the range of activities could be performed online including the use of social media, online banking, information-seeking (search), and media consumption, with little oversight from others. Many ASHAs, hence, expressed the desire to learn to use smartphones and the internet.

We also found that, even when the drive to use the internet was present, poor self-efficacy could discourage uptake of internet services. This could be tied to public perceptions around the use of technology by youth and men, such as P3's husband telling her, *"What will you do with one?"* The ASHAs' limited education also played a role; P1 told us, *"I don't know if I can learn to use the internet because of my poor English."* Despite such perceptions, our participants were eager to take part in online interactions, indicating that common perceptions around the gendered use of technology were being challenged. However, other factors moderated the online activity of our participants—such as privacy concerns. For instance, P2 shared that her Facebook posts received comments from men unknown to her, which made her uncomfortable. Sambasivan et al. and Ahmed et al. have previously pointed out privacy concerns that women face in sharing mobile devices [2, 71]. Our findings indicate that even with personal devices, going online brings a new set of privacy concerns for women.

*Social Media for Leisure.* Leisure as a motivating factor for accessing mobile phones and the internet among marginalized populations has been documented extensively [40, 42, 67]. Previous studies among low-income populations have primarily focused on male youth, uncovering their search for entertainment online [14, 40, 67, 83]. It is not inconceivable then, that the married middle-aged women who made up our participants had different motivations. Though entertainment was certainly a motivation to use a smartphone, we found that ASHAs were also driven by other factors, particularly social connectivity. Our participants were keen to be remain or become more involved in the various communities of practice they were part of, many of which were becoming increasingly active online, in order to retain or acquire social capital [87]. The desire to connect with family, friends, colleagues, and community members to coordinate and conduct social activities and work was frequently cited as a primary motivation for owning a smartphone and accessing the internet for our participants. P4 described her internet activities thus:

*"I mostly use internet for WhatsApp. And anything I need to know, for everything else, I use Google. Like they say—Long live Google baba!" (P4)*

Amid social media use, our interviews indicated that WhatsApp was the platform of choice for our participants. While WhatsApp was used by all the ASHAs, only six ASHAs mentioned using Facebook. Three of these six ASHAs had also joined and were active on Instagram. Though each of these platforms served a different purpose for our participants, there were also overlaps in their use. Our interviews and observations revealed that WhatsApp was mostly used for

messaging, calls, and media sharing; Facebook and Instagram were primarily used for media consumption and sharing.

In addition to using WhatsApp for calls and messaging, ASHAs were part of different groups for coordinating work, staying in touch with extended family or friends, sharing recipes, connecting with neighboring residents, or even interacting with their children's schools. P6 shared, *"Everything happens using WhatsApp now. My son goes to a government school and even they have started keeping parents in the loop through WhatsApp."* The pervasiveness of WhatsApp had reached a point where even late adopters of technology and bureaucratic systems were adopting them. Through participant observation we found that in addition to posts related to the primary purpose of the group, interactions on WhatsApp frequently involved sharing of motivational messages, greetings, jokes, and gossip. For our participants, not being part of these groups could result in a sense that they were missing out on important conversations, as expressed by P6 who did not have a smartphone, *"I need to get one soon."*

*Expressing Identity on Social Media.* The role of an ASHA afforded our participants a unique social position and greater visibility in their communities, unusual for women in the patriarchal society we studied. Prior research has pointed out that marriage in deeply patriarchal societies can be accompanied by a sense of loss of identity for the woman [77]. This was also true for our participants. As expressed by P2, *"Everyone used to know me by my husband's name. But now [as an ASHA] they know my husband by my name."* The desire to develop a stronger voice was apparent in the ASHAs' online activities, particularly in the use of social media. Platforms such as Instagram and Facebook allowed ASHAs to express their likes, opinions, and affinities, providing them a medium to express their individuality and assert themselves. For instance, P2 was an avid user of Facebook and frequently shared pictures of her solo outings to the local community mall. She told us, *"I have two children and much of my day goes to them. I like using Facebook. I can post about things I [emphasis] do or like and want to share... I think other women envy that."* This assertiveness, however, could result in perceptions among other ASHAs that, *"All she [P2] does is spend time on Facebook."*

We also found that the profile descriptions of our participants on Facebook reflected their aspirations. All the ASHAs represented themselves as having graduated from some Delhi university in their Facebook profiles, despite having completed schooling only till tenth grade. This mirrors Kumar's finding on the social media practices of youth in urban India [77]. Though Kumar's study that found that overstating one's education was linked to the aspiration to obtain gainful employment, the ASHAs' we interviewed were not seeking

jobs but simply expressing themselves. Additionally, our interviews revealed that some ASHAs used their maiden names online to be able to re-connect with people who were part of their lives before marriage. However, privacy concerns moderated the ASHAs' expression of their identities. Many participants refrained from posting pictures of themselves, and profile pictures were frequently stock photos, religious quotes, motivational messages, or pictures of their children. Some women also changed their names, using either their husbands' names or an alias. Our interviews indicated that male names adopted were mostly to discourage stalking and unsolicited messages or friend requests from unfamiliar men, a common occurrence among our participants. By keeping their identities secret using an alias, P7 pointed out that she could also keep work and personal life separate as ASHAs were very well-known in their communities.

### Challenging Gender Roles in the Familial Unit

Our participants frequently lived in extended families, co-located with their in-laws. Extended families in this context engage with each other regularly, dividing household tasks and meeting formally and informally for festivals and other social events. As outsiders who had married into the family, not always out of choice, some of our participants' experienced tense relations with other household members. Further, ASHAs had greater visibility in society and autonomy in day-to-day tasks than most women, which challenged traditional gender roles in the home and could face resistance from family members. Hence, ASHAs (especially younger ones) operated at the periphery of the extended familial unit. Although our participants used social media to stay in touch with the extended family and gain familial capital [87], they were also quick to appropriate smartphones and the internet to further their independence and push against patriarchal structures in an effort to become more active and visible members at home and in the society (social capital). This indicates a conflict between the kinds of capital that ASHAs were trying to acquire [87].

*Negotiating Power with Partners and In-Laws.* The “independence” that mobile phones afforded allowed our participants to assume greater power in their homes. For instance, online banking provided our participants with increased control over their income. In 2016, the income of almost all of our participants was directly deposited in their husbands' accounts. In 2018, however, we found that many ASHAs had their own bank accounts and could easily keep track of deposits and withdrawals through online banking services. Such activities helped them garner the respect of their husbands and gain greater appreciation of their work:

*“Before [online banking] I did not know how much I make and my husband also did not realize how*

*much I was contributing to household expenses as only a small amount was being deposited into the bank account every month. Now, instead I have started depositing a lump sum every few months, so that he sees the value of my work.” (P7)*

Financial autonomy and literacy aided by such services allowed our participants to begin to address the power imbalance in their households. For instance, P14 had tense relations with her husband because of his abusive behavior, with her mother-in-law offering little support:

*“I am tired of my husband accusing me of sleeping with other men. I have threatened that the next time he says this, I will just leave. I am earning and can make enough to support my family on my own. As it is, he hardly contributes. My mother-in-law takes his side.” (P14)*

Despite the changing power relations that we observed, smartphones were another medium that could be controlled. P1 shared that her husband did not like her posting her picture on Facebook or WhatsApp and interacting with other men. This led to her limiting her activities on Facebook to media sharing and consumption, particularly posts that she considered unlikely to invite comments from men such as recipes, herbal treatments, and art tutorials. We also found instances of online activities being curtailed by in-laws. P2, who was the only participant who actively shared pictures and personal information online, pointed out how she was able to do so:

*“I do not have to contend with the kind of issues that many other women have to deal with because my husband's parents are, regretfully, no more. My husband is also very understanding.” (P2)*

*Changing Interactions with Children.* Children played an important role in facilitating mobile phone use and improving digital literacy among some ASHAs, particularly older ones. The role of such intermediaries have been pointed out in previous research [35, 72]. We note here that though some ASHAs relied on their children for using internet services, they did not necessarily consider themselves to be “dependent”. They were fairly independent in their mobile phone usage otherwise, frequently responding to work-related messages and calls. Interviews indicated that these ASHAs found that the arrangement suited their needs and digital abilities. One of the older ASHAs (P20) shared that her daughter would let her know when there is a WhatsApp message for her. When asked if she would get her own smartphone, P20 responded, “Let's see. For now, I don't think so. This [arrangement] works well for me, I don't use the internet for much else apart from WhatsApp.” Compared to the prior position of women as primary caregivers, this bi-directional exchange

of knowledge and care affected a change in the relationship between mothers and their children. According to P4, this mediating of technology by her daughter had resulted in her being exposed to her role as an ASHA worker, and a greater appreciation for her labor. Such exposure could also be helpful in other unanticipated ways. When P1 was getting WiFi installed in her home, the default password was set to be her phone number. This resulted in her son stating, *“Ammi, you can’t do that, everyone has your number in this area. I will change it for you.”*

Though their role in the family was shifting, ASHAs were still bound to norms and perceived priorities. Our participants considered their primary commitment to be to their families and not to their role as ASHAs, as pointed out in prior studies [35]. This could result in women prioritizing their children’s and household’s needs over their own:

*“I do need a smartphone for work. But right now, I am waiting for my son to finish his tenth grade board exams. I will get one for him first, he will need it for school. How can I get before him when he needs it more?” (P11)*

We note here that personal devices further provided women a private space that was always available when physical space was a premium in the small studio apartments that the ASHAs typically lived in, in joint families. The lack of personal space led two ASHAs we interviewed to express that they had *“asked my husband to move to a house separate from my in-laws.”* ASHAs were also constantly on the move and busy juggling work and family commitments [35], further limiting the luxury of leisure time. Online interactions, however, not being time-bound could accommodate such busy schedules.

### Developing Camaraderie with ASHAs

All the ASHAs participating in the study were associated with the same primary healthcare center. They met regularly at and around the center while conducting their day-to-day work and attending training sessions. More experienced ASHAs frequently advised newcomers, and knowledge sharing was common in this scenario. As workers engaging in tasks together with a focus on improving healthcare in their areas, ASHAs thus constituted a community of practice.

*WhatsApp for Work.* A key change in the ASHAs’ interactions with each other was brought about by the use of WhatsApp. We found that WhatsApp allowed them to better coordinate work with ASHAs in their area, previously done through calls and SMS [35]. ASHAs frequently worked together to address safety concerns around traveling alone and to lend each other support when needed [17, 35]. More complicated scheduling was now possible as multiple ASHAs could now easily discuss meeting times together online.

ASHAs also shared work-related information regarding training sessions, salary deposits, and immunization dates.

WhatsApp also allowed our participants to widen their circle of ASHAs to include those from other areas, identify and communicate shared struggles, and support each other’s online and offline activities. These activities played a large role in promoting activist behavior and led to a movement for a salary hike and other benefits [35]. From our interviews, we learned that WhatsApp was used to circulate information such as the list of demands from the government, headway made with the government, organized strikes and meetings, news articles, and other updates. The medium not only allowed proactive ASHAs to participate actively regardless of where they were situated, but also allowed other ASHAs to stay in the loop. P3 shared that WhatsApp was used for communication not only because it was pervasive but because it was a secure platform. It was guaranteed that messages would remain private and inaccessible to the government.

Although WhatsApp groups could be useful, they could also be deemed unnecessary or a nuisance by some participants. We observed several instances when group conversations on a topic derailed because of an irrelevant message shared by a participant. Such instances led P12 to appeal to the ASHA who had created the WhatsApp group, *“Ma’am, Please block anyone who sends irrelevant messages.”* On the other hand, sharing and discussing topics not relevant to work could promote empathy-building and a sense of community among the ASHAs, and indeed most of the conversation on the groups were not related to the original topic of discussion. We also learned that new WhatsApp groups were frequently formed that included different ASHAs depending on their area of operation or for coordinating meetings. This resulted in P5 expressing her frustration—*“Who made this group? One more group for ASHAs? What is this one for?”*

*Workarounds to Involve Non-Users.* Though WhatsApp enabled our participants to engage in more and deeper conversations with a larger group of ASHAs, those with limited digital literacy or irregular access to the internet could be inadvertently pushed to the margins of the community. Our observations revealed that frequently in large groups, only a few ASHAs lead and actively participated in the conversation, with most being silent observers. P3 commented on the lack of participation on one channel:

*“There are so many ASHAs on this group but no one responds...I understand that some ASHAs have trouble typing so they don’t respond, they just read. Others at least, please respond.” (P3)*

Such issues resulted in workarounds or *“jugaad”* [68] to involve ASHAs with poor digital (and English) literacies in online conversations. Some ASHAs used the speech-to-text feature on their phones to automate the transliteration



from Hindi to English. Others used the thumbs-up emoji to indicate that they agreed to a meeting time or comment or called another ASHA to let them know that they had seen the message. Similar use of emoji by low-literate users has been previously recorded on WeChat [89]. Thus, we see that social media was not used in isolation, it intersected with other modes of communication to accommodate for a wide range of users, though to varying degrees. The spectrum of use/non-use on the internet has been documented in HCI literature [5] and we share an instance of how users at various points on this continuum might communicate with each other.

### Establishing Legitimacy in Healthcare Provision

ASHAs belonged to the larger community of practice which included all the government healthcare providers operating at or from the local Primary Healthcare Center (PHC). Within this community, ASHAs operated at the margins and occupied the lowest tier in the hierarchical healthcare infrastructure. Their position was considered voluntary, and their views were de-legitimized and overlooked due to their limited medical expertise (up to tenth grade education), despite their deep understanding of the challenges faced by the communities they served [34]. Much literature on front-line health workers has stressed the role of mobile phones in offering a measure of legitimacy while interacting with local communities [42, 66]. Our findings demonstrate how ASHAs also used smartphones to establish legitimacy *within* the healthcare system, among other healthcare providers.

ASHAs quickly adapted their use of the smartphones to aid them in coordinating with and reporting to ANMs (Auxiliary Nurse and Midwife) and supervisors at the local primary healthcare center. Several WhatsApp groups were formed with the ASHAs, ANMs, and staff affiliated with the PHC. Interactions that had previously been carried out primarily through physical meetings, calls, and SMS were now carried out online. However, interviews revealed that social media could exacerbate power differentials between ASHAs and ANMs. For instance, one ANM was known among our participants to record all requests for sterilization by residents under the same ASHA's name, simply because it was convenient and she liked the ASHA. The names of these residents were shared and meeting times coordinated on WhatsApp. This resulted in other ASHAs missing out on their incentive even though the resident may have technically fallen under their purview. We also learned that ASHAs were proactive in creating opportunities to coordinate with doctors and staff at the PHCs, but such efforts were not always welcome:

*"We asked the doctor and staff at the dispensary to help us out by noting down the names of pregnant women who come there since they don't always inform us that they are pregnant. Identifying these*

*women is critical and forms a large part of our incentives. It doesn't take much, all the doctor or staff member needs to do is take a photo and send it to us on WhatsApp. But they can't even do that... They don't think much of us."* (P1)

Despite the potential of social media, particularly WhatsApp, in providing the ASHAs a platform to become more active participants in this community of practice, the ASHAs' efforts could be rebuffed by those higher up in the hierarchical healthcare system in order to maintain the status quo, consciously or unconsciously. Such behavior has been recorded offline [35], and our research demonstrates that power differentials can extend to online interactions. However, ASHAs continued to challenge power structures, even questioning supervisors and government processes. For instance, P2 told us that the next deposit to their bank account by the government would reflect their overdue salary; a piece of information that was widely re-shared on different WhatsApp groups with ASHAs. However, she was skeptical of this news and questioned her supervisor offline to verify asking, *"Is that information accurate?... We have been conned before."*

### Gaining Access into Local Communities

Physical proximity between households in this region encouraged close ties between neighbors. Communities were typically bound together by common infrastructural, environmental, and political concerns. ASHAs were embedded in these communities by virtue of their physical location, however, they found that they had trouble relating to the concerns of the lowest income populations in their region of operation. Though the ASHAs we studied belonged to low-income or low middle-income groups, they were of socioeconomically higher status than many of their target communities who lived in slums [34]. In our interviews, target communities were frequently referred to as *"jhuggi-wale"* or slum dwellers, marking them as a distinct community of practice.

ASHAs occupied a peripheral role within these slum communities as a result of their socioeconomic differences. They tried to gain access by spending significant time explaining their roles as ASHAs and their relevance to the community. Their outsider status frustrated their progress in delivering healthcare services and health information, as echoed by P2, *"Even if I work in this area for ten years it will not be enough."* To become more active participants in these communities of practice, ASHAs tried to build empathy and listen the concerns of community members. P3 shared with us her approach to healthcare provision activities:

*"Over time I have learned that you can't just tell people what to do, who will listen? Become their friend first and then they will work with you."* (P3)

Our participants leveraged social media to assist in the development and maintenance of relationships with residents. They frequently used WhatsApp to communicate with community members in their region of operation. For instance, P3 advised a resident, “*Take my phone number, you can call me or you could even message on WhatsApp.*” This may indicate that WhatsApp was used frequently by local residents and that interactions with ASHAs fit into their existing online activities. From our interviews, we learned that many residents who were previously reluctant to talk to ASHAs on the phone or pick up their calls were willing to contact them on WhatsApp. Social media may have also enabled and encouraged more weak ties [18], such as with ASHAs.

Due to the large settlement of migrant populations in this region, even within low-income communities in this context, there were significant differences in terms of language, literacy levels, and income. These affected an individual’s capacity to use a mobile phone and access the internet and pushed ASHAs to adapt their communication medium and strategy accordingly. For instance, our participants shared that access to free outgoing calls due to Reliance Jio had helped them build a better rapport with low-literate communities. Before Jio, outgoing calls were charged resulting in many community members not calling at all or doing missed calls [23]; residents were more likely to call ASHAs now. Further, self-designated intermediaries within communities helped address language and literacy barriers to mobile use. During one interaction that we observed between an ASHA and a pregnant woman who was less-literate, a literate neighbor volunteered to record the ASHAs’ phone number and contact as needed. Low-cost calls and internet could thus help close the digital divide between socioeconomic groups, particularly when users were supported by knowledgeable community members. However, we acknowledge its potential to widen the gap with the most marginalized groups who might not be able to even afford a phone [85].

ASHAs also faced several infrastructural challenges while communicating with local residents which pushed them to update their digital literacy and find workarounds to problems that arise. During their visits, coverage of various telecom services varied widely depending on the area, particularly in slums with no service and in narrow lanes (or *galis*), where densely packed buildings on either side diminished cellular signals. This presented a challenge to ASHAs who frequently moved about this region, spending most of their time visiting homes located in the *galis*. To deal with such issues, many of our participants owned more than one SIM card to switch to the network operator with the best signal in an area. Alternatively, they communicated on WhatsApp via WiFi at the household they were visiting, to circumvent poor cellular coverage. Both of these were made possible due to low calling and internet costs.

## 6 DISCUSSION

Our findings demonstrated how the ASHAs’ various online activities were linked with a desire to move away from the peripheries of various communities of practice (CoP) towards becoming more active participants. As women from lower middle-income groups living in a deeply patriarchal society, ASHAs were typically late adopters of technology in their familial units (immediate and extended). At the same time, they worked hard to adapt and keep up with the healthcare professionals, ASHAs, and others within the networks they are part of who have moved online. Further, belonging to socioeconomically higher groups than their target populations, they were outsiders to these communities and struggled to work with them and understand their ways of life. As they began to participate on social media and interact with the online world at large, various aspects of their marginalized identity acted on them simultaneously. Below we examine communities of practice from an intersectional perspective, outlining how the multiple identities of marginal members shape their experience of legitimate peripheral participation. Next, we consider how our participants appropriate mobile phones and the internet to move towards empowerment along various dimensions. Finally, we discuss how legitimate peripheral participation might be supported, leveraged, and extended through the design of appropriate interventions.

### Intersectionally Diverse and Intersecting CoPs

Legitimate Peripheral Participation (LPP) theory states that learning and becoming part of a community of practice is a sociocultural process that involves interactions between newcomers and old timers, and engagement with activities, identities, and artifacts [47]. Much HCI literature drawing on legitimate peripheral participation (LPP), however, assumes all newcomers to be equally at the periphery, with little attention paid to the identities of members and how these might impact the process of becoming an active participant [28, 45, 49, 56]. We find that the ASHAs’ multiple roles influenced their interactions as part of various CoPs. As *women living in a patriarchal society*, ASHAs were motivated to challenge gender norms through their use of smartphones and the internet, participation in the CoP of healthcare providers, and by becoming more visible actors in their families and society. However, their gender identity also moderated their interactions online to avoid unsolicited messages from men, and restricted their mobility while visiting local communities. Similarly, the comparatively *poor digital literacies and education* of ASHAs not only placed them at a disadvantage while participating in online CoPs and the CoP of healthcare providers, but also with respect to other ASHAs. Their relatively higher digital literacies compared to local communities also affected their degree of participation with low-literate

members. At the same time, for our participants, improving digital literacy was a major motivation behind going online and was linked to notions of self-empowerment. An *intersectional* perspective allows us to consider the different identities at play that overlap and intersect with each other (such as the ones identified above), while shaping participation in various CoPs [73].

Extending this focus on identity, we point out that individuals are often a part of multiple *intersecting* communities of practice—at home, at work, and online. ASHAs, in particular, interacted frequently with multiple CoPs as a result of the collaborative nature of their work. They served as the conduit between healthcare professionals and local communities, not only sharing information but translating knowledge across groups to better communicate concerns effectively [34]. To be able to intermediate and translate information appropriately and contribute more strongly to each CoP, they needed to assume a more central role, which they attempted to do. For example, access to local communities helped ASHAs better communicate local medical problems to the community of healthcare providers. Conversely, they would be better equipped to provide healthcare to local communities if they were legitimized and empowered to participate within the healthcare community. Thus, legitimate peripheral participation can be better understood in context of the other communities of practice that members belong to. Focusing on the intersecting CoPs that an individual is part of, rather than a single community of practice, can shed new insight on the motivations of newcomers to participate. It also allows us to speculate what *new* CoPs might be empowering and how they might support the identified needs of individuals.

We also note that the CoPs that ASHAs belonged to were not homogeneous, they were comprised of individuals identifying as and belonging to diverse genders, age groups, socioeconomic status, and geographies. Even within a seemingly homogeneous group such as the CoP of ASHAs, some members were better positioned and empowered to participate actively as a result of their digital literacy and age; power differentials could act to push and keep others at the periphery. An *intersectional* perspective can also help illuminate such differences, allowing us to uncover ways in which different members might be differently empowered.

### Empowerment as Forms of Capital

As legitimate peripheral participants, ASHAs made concerted efforts to become more active members of each CoP. Lave and Wenger point out that the degree of participation that peripherality in a CoP enables can be “a source of power or powerlessness” [47]. In the case of the ASHAs, we find that their participation could be curtailed in order to maintain the status quo in various CoPs. Smartphones and the internet empowered them to carry out acts of resistance against

these power structures and enable participation. Here, empowerment in each of the CoPs can be characterized as the acquisition of different forms of cultural capital—social, aspirational, resistant, and familial [87]. Below we consider the ASHAs’ attempts to move away from the margins in various CoPs and how these were empowering or not.

Within the CoP of the primary healthcare center, ASHAs were less empowered to make decisions relating to healthcare provision and their efforts to do so could be rebuffed by doctors and staff. Even if greater participation of the ASHAs was enabled, our participants would still remain at the peripheries of this community as a result of differences in professional expertise. ASHAs continued to question power differentials, though, building *resistant capital* or “knowledges and skills fostered through oppositional behavior that challenges inequality” [87] which could inform future attempts to resist the same or other power structures, indicating that participation within the margins can be empowering.

In the extended family unit, the ASHAs’ use of mobile phones were not only directed towards acquiring *familial capital* by interacting with their extended family on social media, but also in engaging *aspirational capital*—“the ability to maintain hopes and dreams for the future, even in the face of real and perceived barriers” [87]. Mobile phones afforded greater mobility and allowed ASHAs to expand their circle of acquaintances, assume greater control over their finances, find a private space, and have conversations that fit into their scattered leisure time. Our participants found these activities to be empowering by effecting a change in traditional gender norms and household structures, and enabling them to become visible members of the family and society, despite resistance from their partners and in-laws. Thus, margin boundaries can be expanded and redrawn.

Increased participation of some participants, however, could push others to the margins, such as in the CoP of ASHAs. Younger, tech-savvy ASHAs were quick to leverage the internet to support their work and gain *social capital* in the various CoPs they were part of online, while older and less-literate ASHAs were less inclined to engage deeply on social media. We note that only a certain degree of participation might be perceived as empowering; full participation may not always be the desirable outcome for the peripheral participants. For example, privacy, and separation between work and personal life were central concerns for our participants as they became increasingly active online, moderating their online activity.

We emphasize here that the marginal are not always in a place of less power. In the local migrant communities for instance, the ASHAs were of socioeconomically higher status. They were motivated to play a more central role in these communities to be better able to provide healthcare that was cognizant of the needs and sociocultural practices of

residents. Though they were newcomers looking to build *social capital* by immersing themselves in these contexts and learning the migrant communities' norms, practices, and languages, they came from a position of more power as government healthcare providers.

### Considerations for Design

Our participants appeared to be driven to participate in communities of practice to be empowered along several dimensions—challenging gender norms, becoming digital citizens, and providing better quality healthcare. In light of the discussion above, we consider how design could thoughtfully and responsibly support, leverage, and extend the ASHA's activities, so that their peripherality operates as a place of power and not powerlessness, in various CoPs.

To *support* current efforts, barriers to full participation need to be addressed. Old-timers in the different CoPs that ASHAs were part of need to be cognizant of varying digital literacies, address gendered expectations and norms relating to technology use, value different professional expertise, and pay attention to class differences. For instance, the ASHA's current use of social media in conjunction with phone calls and SMS to include older ASHAs and socioeconomically disadvantaged residents could be formalized and replicated in other CoPs. Concurrently, we need to dismantle online interactions that enforce power structures. For instance, within the CoP of healthcare providers, this means seriously considering, accepting, and implementing suggestions made by ASHAs. One way to do this could be to designate an ASHA to represent the viewpoints of ASHAs and moderate interactions with other healthcare providers online.

Change in gendered expectations and norms that are embedded in the larger society are harder to effect, and might be better served by *leveraging* current efforts. In particular, mobile health interventions that target use by frontline health workers could align with their desire to become visible actors in society while providing a means to improve digital literacy. For example, technical infrastructure to digitize mundane tasks such as data collection have been well studied and talk to this aspect [9, 35]. Additionally, data-driven applications could empower health workers to make decisions relating to healthcare in their areas, while leveraging their efforts to understand local communities and provide better healthcare [21]. This would also legitimize their roles, not just in the eyes of local communities as prior literature has pointed out [44, 66], but among other healthcare providers.

Understanding the motivations behind current efforts to participate can also help identify how and where they might be *extended*. One way to expand digital literacies could be to generate more opportunities to go online. Social and monetary incentives, such as a monthly budget for using mobile data, could encourage internet use. Profiles on social media

can also reveal aspirations [81] and suggest new places for empowerment—such as educational opportunities, and being able to maintain (online/offline) identities and relationships after marriage. Additionally, applications that allow ASHAs to keep track of their multiple modes of communication such as phone calls, SMS, and social media and messaging platforms like WhatsApp and Facebook, could support and extend ASHA's capacity to connect with individuals at different ends of the internet use/non-use continuum [4].

## 7 CONCLUSION

The field of HCI4D has long studied mobile adoption and use in the Global South, with an increasing focus on the practices of women from marginalized backgrounds. The rise of inexpensive internet in India over the last two years, has enabled (and is enabling) marginalized users for whom internet access was cost-prohibitive, to come online. We presented our findings from a qualitative study of the mobile and social media practices of frontline health workers in Delhi, a demographic for whom internet access was previously difficult. Drawing on the lenses of *legitimate peripheral participation* and *intersectionality*, we showed how our participants' online activities were motivated by self-empowerment in the various *communities of practice* that they belonged to. Our research presents takeaways for researchers investigating mobile, internet, and social media use and adoption, and deploying mobile health interventions in the Global South.

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